TELEDYNE
CETAC TECHNOLOGIES
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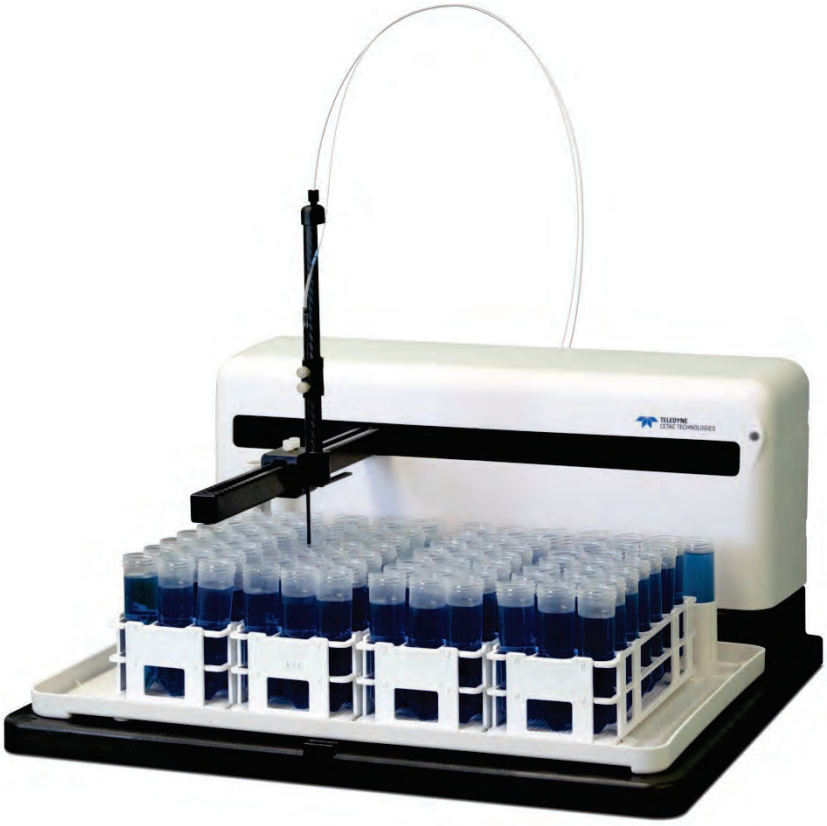
ASX-560 Autosampler



Service Manual

Manual Part Number **480218** Draft 0

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Teledyne CETAC Technologies
Customer Service & Support
14306 Industrial Road
Omaha, Nebraska 68144, USA
Phone (800) 369-2822 (USA only)
Phone (402) 733-2829
Fax (402) 733-1932
E-mail custserv@cetac.com

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1 Introduction

About This Manual

This manual describes the procedures for repairing the CETAC ASX-560 autosampler.

Who Should Read This Book

This manual is intended for use by customers who have experience repairing laboratory equipment and by service technicians at CETAC-authorized service centers. Performing repairs or modifications beyond the ones described in this manual may void the warranty on the instrument.

Important Safety Precautions

WARNING

SHOCK AND MECHANICAL INJURY HAZARDS
The *Operator's Manual* contains safety-related information which is not repeated in this Service Manual. The *Operator's Manual* is supplied on the CD with the autosampler. It may also be downloaded from www.cetac.com. If you need safety information in a language other than English, refer to the included *Autosampler Safety Manual*.

WARNING

SHOCK HAZARD
Ensure the power cord is turned off and disconnected before touching the autosampler or opening any protective covers. Replace all covers and guards before reconnecting power.

WARNING

CHEMICAL INJURY HAZARD
The autosampler may have been contaminated with hazardous materials. Make sure you know about any materials which may have contaminated the autosampler, and take precautions appropriate for the hazards associated with those materials. Exposure to laboratory chemicals may result in serious injury.

General Precautions for Protecting the Autosampler

CAUTION

Static Discharge
Discharge static buildup and ground to the autosampler base or cabinet before performing any maintenance. Do not touch or short-circuit the contacts on the communication ports.

CAUTION

Moving the Z-Drive
Do not allow the cable to bend sharply. Avoid pushing up on the slider or pushing on the Z-drive cable. Move the Z-drive by rotating the rotor on the back of the autosampler. Do not move the Z-drive or sample probe directly as damage to the drive cable may result.

CAUTION

Lubrication
Never lubricate the autosampler. Oil or other lubricants will accumulate contaminants and cause the moving parts to bind.

NOTE

To prevent contamination, wear gloves when handling the probe or other surfaces which may come in contact with samples.

Repair Strategy

In general, the repair strategy for this product is board replacement or mechanical assembly replacement. Circuits are protected by a conformal coating, so component-level repair of the circuit boards is strongly discouraged.

External Parts Identification

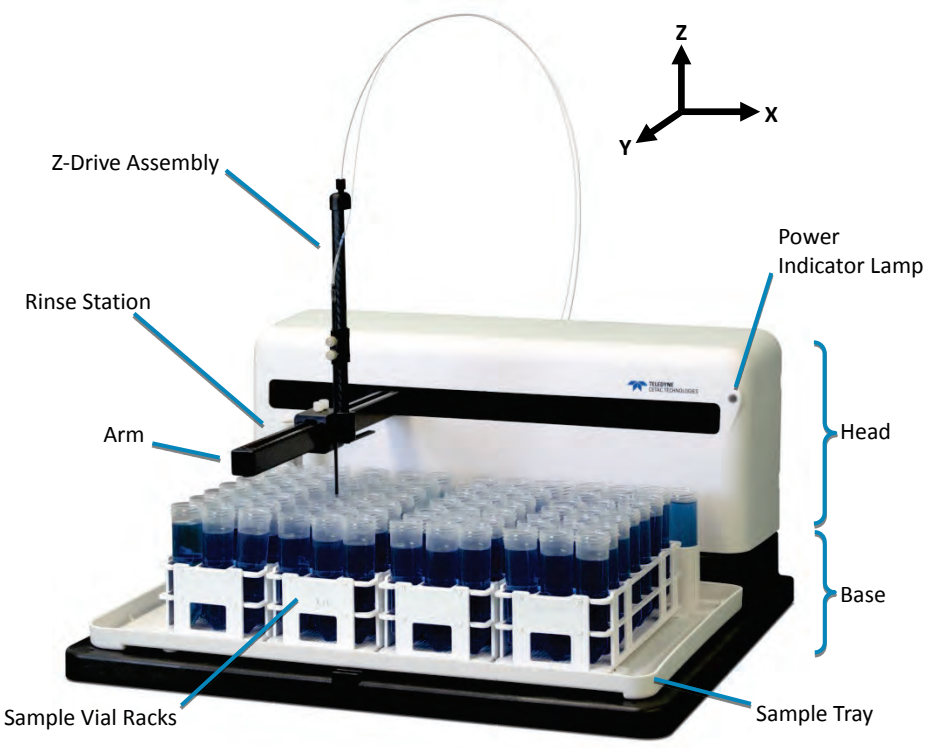


Figure 1-1 ASX-560 Autosampler—Front View

The following components are located on the front of the autosampler and are shipped with the autosampler (see Figure 1-1).

- **Sample Tray.** The sample tray holds the rinse station, sample racks, and standards vials in place. The tray also contains small spills.
- **Sample Vial Racks.**
- **Standards Vials.**
- **Rinse Station.**
- **Arm.** The arm moves the sample probe horizontally.
- **Z-Drive.** The Z-drive moves the sample probe vertically. The Z-drive assembly includes a Y-axis slider block and guide plate as well as the sample probe. The Z-drive attaches onto the autosampler arm.
- **Power Indicator Lamp.** The LED indicates that the autosampler is connected to a power source and turned on.

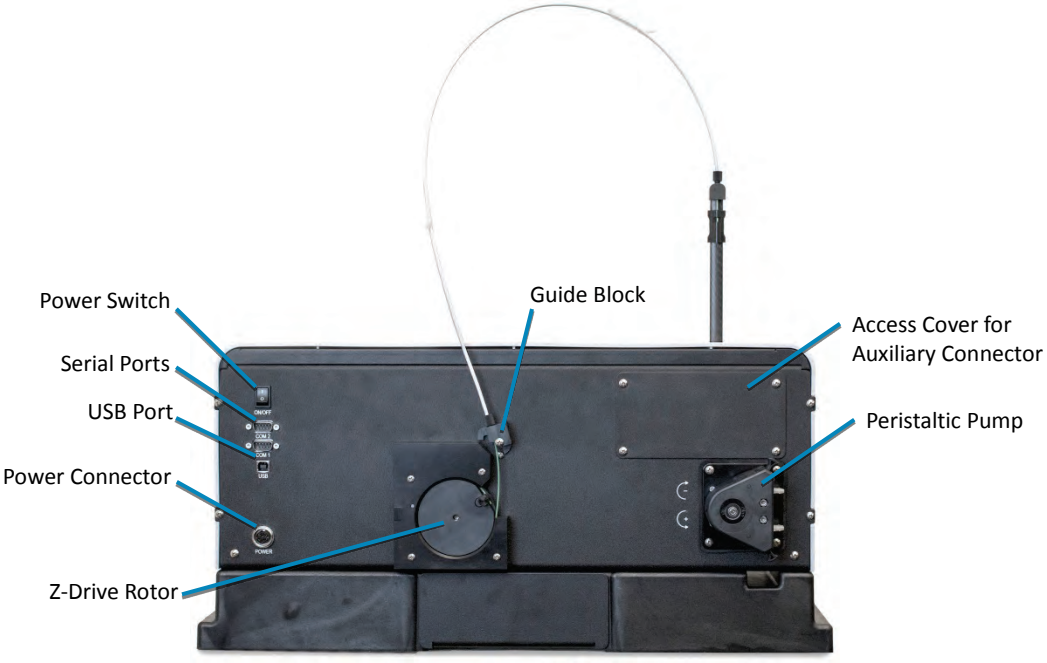


Figure 1-2 ASX-560 Autosampler—Back View

The following components are located on the back of the autosampler and are shipped with the autosampler.

- **On-board peristaltic pump.**
- **Serial Ports.** The COM1 port connects the autosampler with the analytical instrument's host computer. The COM2 port connects the autosampler to other external devices, such as an autodilutor.
- **USB Port.** The USB port can be used to interface the autosampler with the host computer.

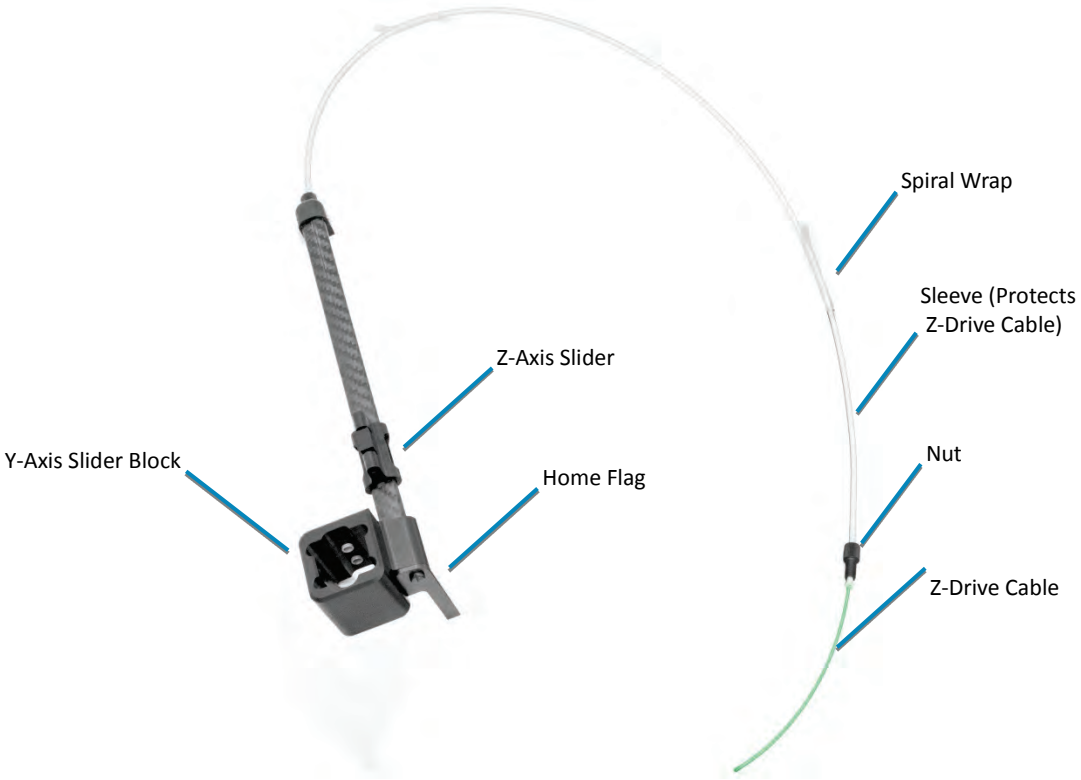


Figure 1-3 ASX-560 Autosampler—Z-Drive Assembly

List of Replaceable Parts

Difficulty levels are defined as:

- **Easy** – The part can be replaced by the user with no special training. Minimal disassembly is required.
- **Advanced** – The part can be replaced by users who are confident in their electrical and mechanical repair skills. Some procedures require good manual dexterity and the use of special tools.
- **Factory** – The autosampler should be returned to Teledyne CETAC Technologies for repair. Custom-made tools or specific adhesives may be required, or the procedure may be especially complex or error-prone.

Part numbers and availability are subject to change without notice. See the *Spare Parts and Accessories Catalog* for the latest list of spare part numbers.

Part Number	Description	Difficulty Level	Where to Find Service Instructions
SP6103	24-Volt Power Supply	Easy	Operator's Manual
SP7448	Arm Tube Assembly	Advanced	Page 41
SP7456	Base Plate	Easy	Page 33
	Bearings, X-Axis Leadscrew	Advanced	Page 39
SP7453	Bearings, X-Axis linear	Advanced	Page 39
Various	Carbon Fiber Sample Probes	Easy	Operator's Manual
Various	Front Cover	Easy	Page 32
SP7451	Guide Shaft	Advanced	Page 39
SP7460	LED Assy	Factory	
SP7452	Main Board	Advanced	Page 53
	Peristaltic Pump Shoe (Roller Band)	Easy	Operator's Manual
Various	Peristaltic Pump Tubing	Easy	Operator's Manual
SP7443	Power Switch	Advanced	
	Power/RS-232 Cable Assy	Factory	
SP7440	Pump Motor Kit - 2 Channel	Advanced	Home 45
SP7457	Rinse Station	Easy	Operator's Manual
Various	Rinse/Drain Tubing	Easy	Operator's Manual
SP7438	Rotor Assembly	Advanced	Page 46
SP7439	Tray Assembly with 10 Standards Positions	Easy	Operator's Manual
	USB Cable Assy	Factory	
SP7475	USB Connector, internal	Advanced	Page 52
SP5222	X Axis Drive Belt	Advanced	Page 49
SP7450	X Axis Lead Screw Kit	Advanced	Page 39
SP7444	X/Y/Z/Crash Sensor	Advanced	Page 42 (X/Y), Page 46 (Z)

SP7445	X-Axis Stepper Motor	Advanced	Page 49
SP7442	Y Axis Cable Assembly (E-Chain)	Advanced	Page 43
SP7449	Y Axis Lead Screw Kit	Advanced	Page 41
SP7458	Y Home Flag - w/ probe guide	Easy	Page 22 & Operator's Manual
SP7459	Y Home Flag - w/o probe guide	Easy	Page 22 & Operator's Manual
SP7446	Y-Axis Stepper Motor	Advanced	Page 42
SP7437	Z Axis Drive Assembly	Easy	Page 16, Instructions are also supplied with part
SP7174	Z Axis Tubing Replacement Kit	Easy	Instructions with part
SP7447	Z-Axis Stepper Motor	Advanced	Page 48

How to Obtain Spare Parts

To see what parts are available, refer to the *Spare Parts and Accessories Catalog* available from CETAC. It is recommended to order parts by telephone, so you can discuss your particular needs.

Setting Up a Service Area

The work surface should meet the same space requirements as specified for the laboratory in the *Operator's Manual*.

An ESD work surface is recommended.

Recommended Service Tools

- Laboratory gloves to prevent personal exposure to hazardous substances and to prevent contamination of equipment which may come in contact with samples.
- Protective eyewear
- Other personal protective equipment (as needed for protection from hazardous materials which may have contaminated the autosampler)
- ESD wrist strap
- Set of slotted screwdrivers
- Short-handled slotted screwdriver
- Set of Phillips screwdrivers
- Set of hex keys or Allen wrenches (English measurements)
- Gear puller (approximately 1-1.5 inch/2-4 cm)

- Lint-free laboratory wipers such as KIMTECH SCIENCE™ KIMWIPES® Delicate Task Wipers.
- PTFE lubricant (Super Lube® multi-purpose synthetic grease or equivalent)
- LOCTITE® Threadlocker Blue 242® or equivalent
- Plastic wire ties
- Clean paintbrush (for brushing away dust)
- Large sink or tub (for washing the sample tray)
- Laboratory-grade cleaning agents
- PC with at least one free USB port and at least one free serial port
- Voltmeter

General Tips and Tricks

- Use the standards tray to organize small parts as which have been removed from the autosampler.
- Tighten KYNAR® thumbscrews using only your fingers (never use pliers).
- Do not lubricate the lead screws. Lubricants of any type may lead to fouling, sample contamination, and increased friction.

Returning the Product to CETAC

Refer to the following information if you need to return the product to Teledyne CETAC Technologies for service.

Shipping the Product

Follow these guidelines when shipping the product:

- **Do not return products which are contaminated by radioactive materials, infectious agents, or other materials constituting health hazards to CETAC employees.**
- **Use the original packing materials.** If the original shipping materials are not available, place a generous amount of shock-absorbing material around the instrument and place it in a box that does not allow movement during shipping. Seal the box securely.
- **Contact Teledyne CETAC Technologies before shipping the product.**
- Pre-pay all shipping expenses including adequate insurance.
- Write the following information on a tag and attach it to the product:
    - Name and address of the owner
    - Product model number and serial number
    - Description of service required or failure indications

- Mark the shipping container as FRAGILE.
- In all correspondence, refer to the instrument by model name or number and full serial number.

Where to Go for More Information

> **NOTE**
>
> This service manual is not intended to stand alone. You will need to refer to information in other documents—especially the *Operator's Manual* and the *Spare Parts and Accessories Catalog*.

In addition to this manual, you can refer to the following resources:

- New versions of this manual may be available under "Service and Support" on CETAC's Web site:

  www.cetac.com

- *ASX-560 Autosampler Operator's Manual*, available on the CETAC Web site and on the CD which comes with the autosampler.
- *ASX-560 Autosampler Spare Parts and Accessories Catalog*, available on the CETAC Web site.
- *CETAC Autosampler Safety Guide* provides basic safety-related information in a variety of languages.
- Online help within the ASX Dashboard software.

Teledyne CETAC Technologies Customer Service and Support:
Phone: 1 (800) 369-2822 (USA only)
1 (402) 733-2829
Fax: 1 (402) 733-1932
E-mail: custserv@cetac.com

2 Basic Maintenance

Many routine maintenance tasks are described in the *Operator's Manual* and are not repeated in this *Service Manual*. Those tasks include:

- Checking for Leaks
- Replacing Peristaltic Pump Tubing
- Setting the Z-Axis Travel
- Replacing the Z-Drive
- Replacing the Rinse Station
- Replacing the Sample Tray

Cleaning the Autosampler

Use of the autosampler often results in spills on autosampler components such as the sample tray. To avoid spreading contamination which could cause injury or equipment damage, it is a good practice to thoroughly clean the exposed surfaces before performing repairs.

WARNING	**SHOCK HAZARD** **Do not allow any liquid to enter the instrument cabinet other than as intended through the specified tubing, or come into contact with any electrical components. The instrument must be thoroughly dry before you reconnect power, or turn the instrument on.**
CAUTION	Do not allow the cleaning agent to come into contact with the lead screws. Also, never lubricate either of the two lead screws.
CAUTION	Do not clean with carbon tetrachloride.

1. Shut down and unplug the autosampler.
2. Remove the sample tray.
3. Wipe loose particles off the Y-axis lead screw with a dry, lint-free cloth.

   The Y-axis lead screw is the large metal screw located inside the autosampler arm.

Figure 2-1 Y-Axis Lead Screw

CAUTION **Never lubricate the lead screws**. The lead screw nuts are compounded with a dry film lubricant which is intended to be used without additional lubricants. Oiling the lead screws will cause gumming, galling, and binding of the moving parts.

4. Wipe the autosampler exterior and base until they are clean, using a towel dampened with a lab-grade cleaning agent, followed by a towel dampened with clear water.

   Pay special attention to the Y-axis slider block and the autosampler arm.
5. Wash the sample tray in a warm detergent solution.

   Make sure you remove all spills and stains.
6. Rinse the sample tray with water and then dry it.

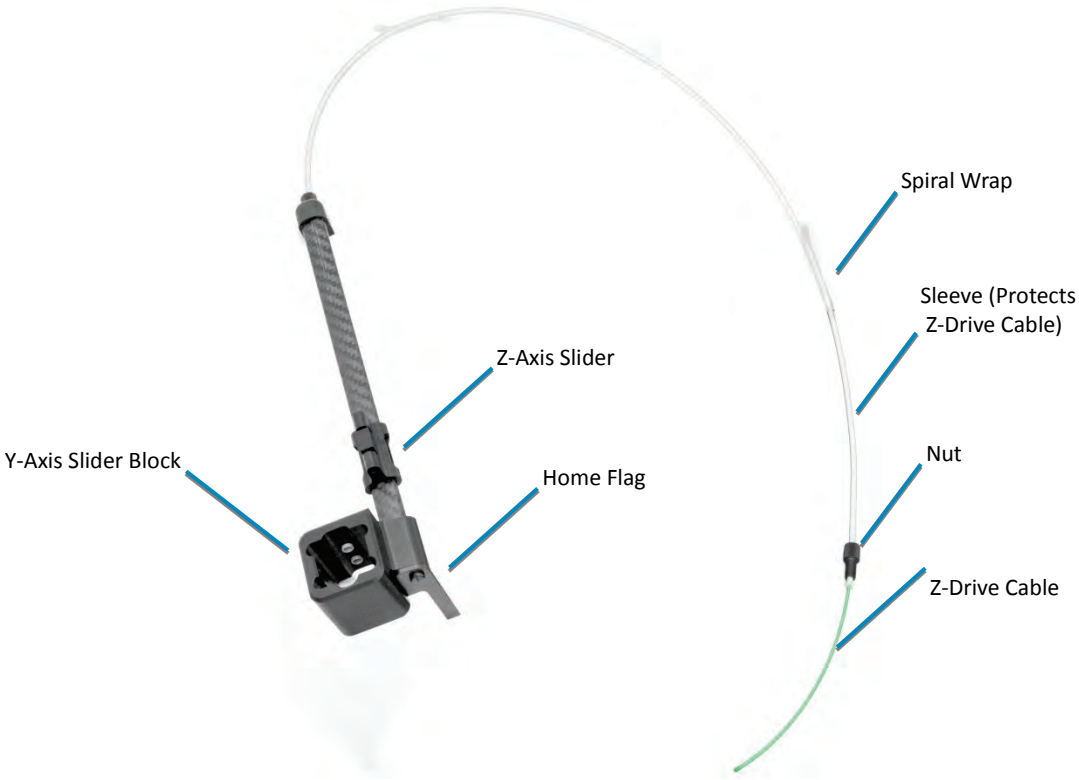
   Ensure that the sample tray is thoroughly dry.
7. Replace the sample tray on the autosampler base.

Replacing the Z-Drive

These instructions assume you are installing a new, standard-model Z-drive.

How Does the Z-Drive Work?

The Z-drive is driven by a length of cable. A rotor on the back of the autosampler moves the cable, which slides the probe up and down on the Z-drive. A mounting block on the back of the autosampler pivots back and forth to allow free motion of the cable while preventing the cable from kinking.



How Should I Care for the Z-Drive?

CAUTION

Do not allow the cable to bend sharply. Avoid pushing up on the slider or pushing on the Z-drive cable.

Do not tighten the thumbscrews or nuts with anything other than your fingers.

Removing the Old Z-Drive

1. Place the autosampler on a flat surface and turn the unit off.
2. Remove the two thumbscrews from the Y-axis slider block.
3. Remove the cable from the rotor by loosening the thumbscrew on the rotor and also removing the two thumbscrews from the guide block. Remove the old Z-drive from the arm by pulling the whole Z-drive forward and off the autosampler arm.

Installing the New Z-Drive

1 Remove Z-drive from the bag.

2 Slide the Z-drive onto the y-arm until the two holes in the Y-axis slider block align with the matching holes in the Y-axis carriage.

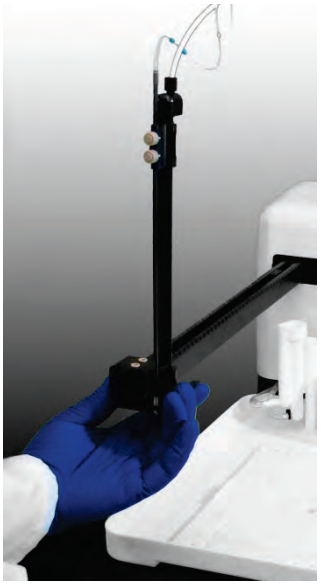


Figure 2-2 Sliding the Z-Drive Onto the Arm

3 Secure the Z-drive to the carriage using the two thumbscrews.

Tighten the thumbscrews using your fingers.

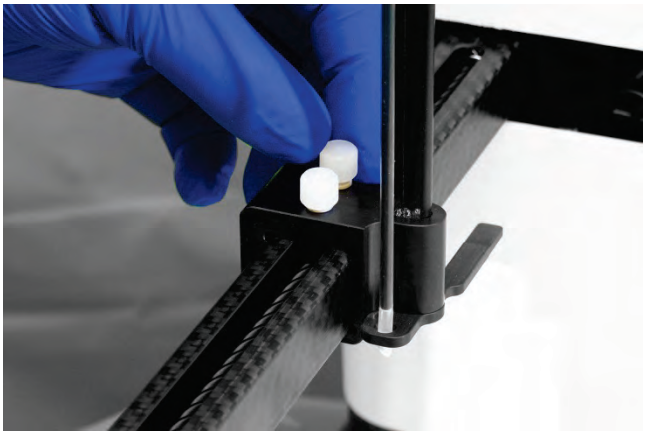


Figure 2-3 Securing Z-Drive Onto the Arm

4 Feed the cable through the rear guide block and around the rotor, then tighten the nut to secure the cable sleeve to the guide block.

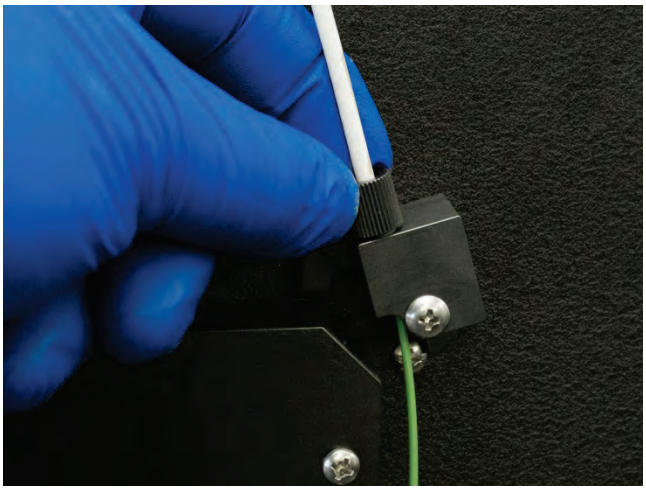


Figure 2-4 Guide Block with Nut

5 Turn the rotor clockwise as far as it will go.

6 Finish sliding the cable around the rotor on the back of the autosampler. Loosen the thumbscrew on the rotor to allow the cable to pass through the clamp, with about 2 mm of cable extending past the clamp.

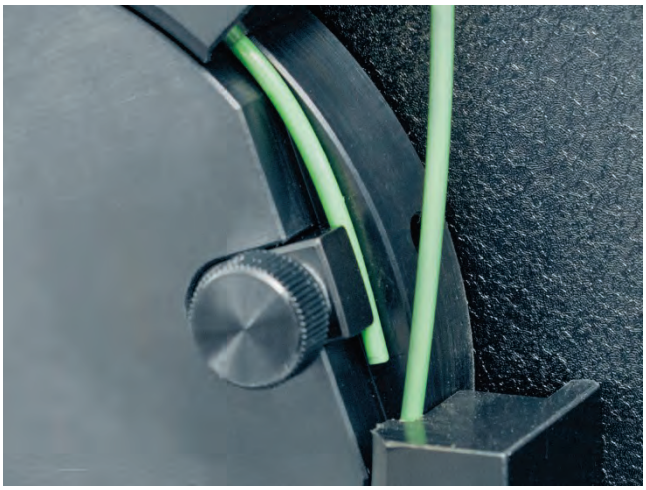


Figure 2-5 Position of Cable on Rotor

7 Verify that there is a small gap between the Z-axis slider and cap at the top of the Z-drive (approximately 1-3 mm). Adjust the cable a bit if necessary.

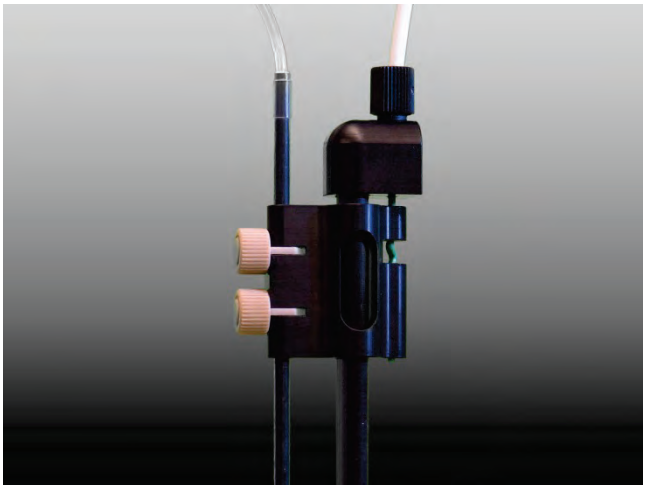


Figure 2-6 Sample Probe at Top Position With Gap

8 Hold the cable flat against the rotor and secure the cable by tightening thumbscrew on the rotor. The thumbscrew should be as tight as possible using just your fingers.

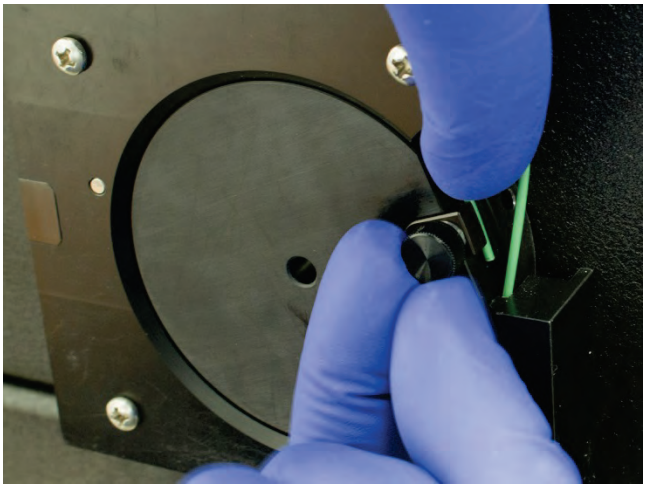


Figure 2-7 Securing Cable to Rotor

The cable is pre-cut to the proper length and does not need to be trimmed when properly installed.

9 Rotate the rotor back and forth to ensure that it moves freely. If there is excessive friction, check that the full width of the cable is under the clamp. Also check that the end of the cable is not rubbing on the shroud around the rotor.

CAUTION Never push the Z-axis slider to move it up or down. Pushing on the Z-axis slider can kink the drive cable. Instead, rotate the Z-drive rotor on the back of the autosampler.

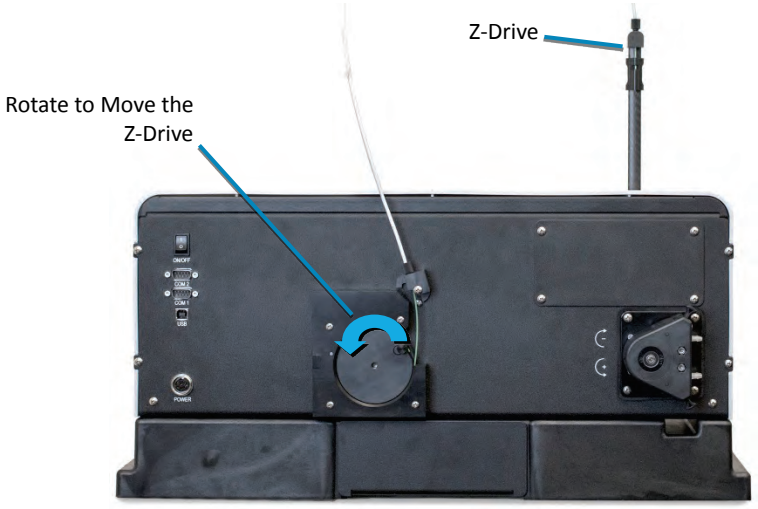


Figure 2-8 Z-Drive Rotor

10 Install a sample probe.

11 Use the utility software to align the probe over the rinse station.

12 Use the utility or your instrument control software to move the probe to several rack positions to make sure the probe is hitting positions correctly.

Replacing the Home Flag/Guide Plate

The autosampler uses a Y-axis home position flag to verify that the Z-drive is fully in the home position (over the rinse station). Some applications use a version of this part which also extends forward to provide a guide plate for the sample probe.

The home flag can be replaced if it is damaged. You will need a short-handled slotted screwdriver.

1. Shut down and unplug the autosampler.
2. Remove the screw.
3. Replace the home flag.
4. Replace the screw.

The home flag does not need to be adjusted or trimmed.

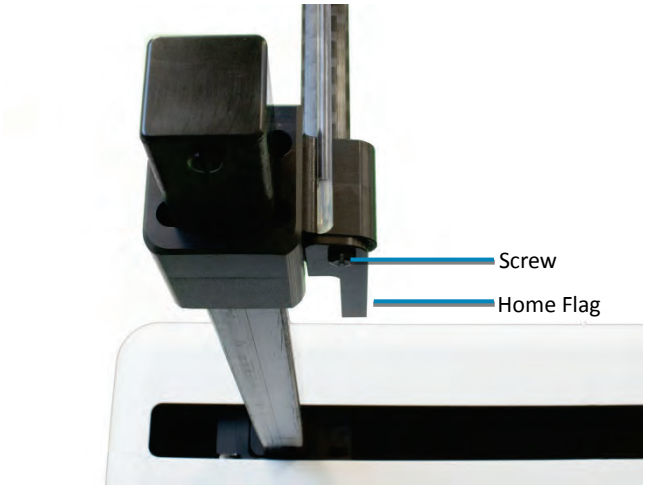


Figure 2-9 Home Flag

3 Troubleshooting the Autosampler

In the event that the product does not function properly, isolate the problem to determine if it originates in the host computer, the analytical instrument, or the autosampler.

This chapter explains how to troubleshoot autosampler problems. If you cannot solve a problem using the steps given in this chapter, you should contact Teledyne CETAC Technologies Customer Service and Support.

Summary of Common Problems

Problem	Possible Cause	Solution
Autosampler does not initialize	AC Power Cord or DC power cord not connected.	Plug AC power cord firmly into wall plug and into desktop power supply.
	Power LED is not illuminated.	Plug DC power cord firmly into plug at back of cabinet.
Autosampler does not move when commanded.	RS-232 or USB cable not connected or connected properly.	Reconnect cable. Make RS-232 and USB are not connected at the same time.
	Correct "COM" port is not selected.	Use C-Term to verify correct COM port.
		Verify that ICP program uses same COM port.
		Download and run CETAC test software from www.cetac.com.
Power supply LED flashes when autosampler power is turned on.	Possible short on main control board.	Contact CETAC.

Axis does not "Home" after power has been applied	PIC for that axis did not initialize properly.	Turn off autosampler power, wait 30 seconds, and turn on power.
	"Home" sensor for that axis is not working.	Connect digital voltmeter (DVM) to sensor output and manually move axis to and from home position. A 4VDC change should be detected.
Axis tries to keep moving after reaching "Home" position.	"Home" sensor for that axis is not working.	Connect DVM to sensor output and manually move axis to and from home position. A 4VDC change should be detected.
No movement in X direction	X axis belt is not properly on	Open the unit. Make sure that on the right side of the unit the belt is on the leadscrew and the X motor sprockets.
Z axis chatters when the system is turned on	Z drive is misaligned	Refer to the Operator's Manual for Z-drive assembly installation

Power System Problems

A possible cause of system malfunction is a problem in the power system. If the system is not functional, it is possible that it is not receiving power. If this is the case, the LED power indicator light on the autosampler will be off. To troubleshoot this problem, complete the following steps in sequence until the problem is solved:

1. Check that the power switch on the autosampler is turned on.
2. Check that the power cord is plugged in firmly between the power input on the autosampler and the external power supply and also between the power supply and the wall outlet.

   If the cable is plugged in, ensure that it is not damaged in any way.
3. Check that the LED on the power supply is illuminated.

   If the LED is not illuminated, check the wall outlet using a device approved for that purpose.

   If the wall outlet is working and the voltage is acceptable, unplug the external power supply from the autosampler, but leave it plugged into the wall.

   ➢ If the LED is not lit, the power supply is faulty and requires replacement.

- If the LED is lit when unplugged from the autosampler but turns off when plugged into the autosampler, the autosampler may have an internal short and requires repair.

4 Check the wall outlet.

5 If the external power supply LED is illuminated while plugged into the autosampler, cycle the autosampler power switch. The autosampler sample probe should move up and the autosampler should initialize. After initialization, the power LED on the front of the autosampler should light up.

- If the cords are properly connected, power is available, the external power supply is good, and the unit still does not initiate, continue troubleshooting.

Communications Interface Problems

Operation of the autosampler is directed by the host computer. A malfunction can indicate a problem with the RS-232 or USB cable (connected between the host computer and the autosampler) or with the configuration of the software on the host computer. The following sections explain how to troubleshoot these problems.

RS-232 Serial Cable Problems

1 Check the RS-232 cable to ensure it is plugged in to the COM1 port on the autosampler.

If the cable is plugged in, ensure that it is tightened properly and not damaged in any way.

Note that the cable must be plugged into the COM1 port, not the COM2 port.

2 Check the host computer to ensure that the RS-232 cable is connected to the appropriate COM port.

If the cable is plugged in, ensure that it is tightened properly and not damaged in any way.

3 Check the serial port settings (9600, N, 8, 1).

If the wrong port or baud rate is selected, change the configuration.

USB Cable Problems

Either RS-232 or USB may be used, but not both at once.

1. Check that the USB cable to ensure it is plugged into the port on the autosampler.
2. Check the host computer to ensure that the USB cable is connected to the appropriate USB port.

   Note that if you move the USB cable to a different USB port, the driver may assign a new COM port number.
3. Check that the USB cable is not damaged in any way.
4. Check the host computer to ensure that the USB drivers are installed for USB operation of the autosampler.

   Load the proper USB drivers to the host computer from the CD that was provided with the autosampler.

Software Configuration Problems

If the communication cable is connected properly and the system is still not functioning with the instrument control software, ensure that the software is communicating correctly with the autosampler. To do so, use the supplied ASX Dashboard software.

1. Connect to the autosampler using the Autosampler IQ-OQ utility which in the ASX Dashboard.
2. Toggle the pump on and off..

   If the commands have no effect, and a USB connection is being used, check that the autosampler is plugged into the *same* USB port as it was when the driver software was configured. Unlike many consumer devices, each USB port used as a "virtual" COM port must be individually configured.
3. If manual controls work, but the autosampler does not operate with the instrument control software, carefully check that the software is configured to use the COM port where the autosampler is plugged in.

   If a USB connection is used, and if the manual commands work, but the instrument control software fails to operate the autosampler, check that the same COM port number is configured in the software and in the USB device driver.

Z-Drive Problems

An autosampler malfunction may be caused by a problem in the Z-drive assembly. You can easily determine that a malfunction is related to the Z-drive if you hear a loud chattering noise when the autosampler power switch is on or if the sample probe is not moving. To troubleshoot Z-drive problems, complete the following steps:

1. Ensure that the Z-drive is installed correctly.
2. Check the Y-axis home position flag.

   When the Z-drive returns to the home position, the flag should enter the corresponding slot.

   If the flag is damaged, replace it.
3. Ensure the sample probe is moving freely.

   Gently rotate the rotor on the back of the autosampler to move the sample probe up and down. If the sample probe is binding, free the sample probe assembly.

   NOTE:

   If you cannot free the Z-drive, you will need to replace it. See page 16 for information about mounting a new Z-drive. You can order a new Z-drive from Teledyne CETAC Technologies.
4. Inspect the Z-drive cable for sharp bends, kinks, or rough spots.

   If the cable is damaged, replace the Z-drive.

Contamination and Carryover Problems

1. Check the rinse station tubing. Rinse solution should flow upward from the bottom of the rinse station.
2. Check the end of the rinse solution drain tube. It should be above the surface of the liquid in the waste container.
3. If recycling the rinse solution, check whether the rinse solution needs to be changed.
4. Examine the sample transfer tubing. Make sure that it is as short as possible while still free to move. Make sure that there are no unnecessary fittings on the sample transfer tubing—fittings can create small reservoirs where contaminants can hide.
5. Watch for liquid dripping from the sample probe as it moves. It may be necessary to slow the autosampler down to reduce droplet shedding. This can be adjusted using the Speed Shift utility in the ASX Dashboard software.
6. Check that the sample probe remains in the rinse station long enough. This can be adjusted using the Speed Shift utility.

Using the C-Term™ Terminal Program

The autosampler can be controlled by sending it simple commands. This can be helpful for troubleshooting. You can use any terminal emulation program. This chapter explains how to operate a CETAC autosampler using the C-Term terminal program, which is provided on the software CD.

C-Term is a simple terminal program developed to validate the installation and functionality of various CETAC devices. C-Term communicates through a serial (RS-232) port on the host computer. If the autosampler is connected to a USB port, the device driver will create a virtual serial port.

Starting C-Term

1. Check that the autosampler is connected to the PC.
2. Close any programs which might be communicating with the autosampler.
3. On the Start Menu, click All Programs | Teledyne CETAC Technologies | Support Tools | C-Term.

Overview of the C-Term Window

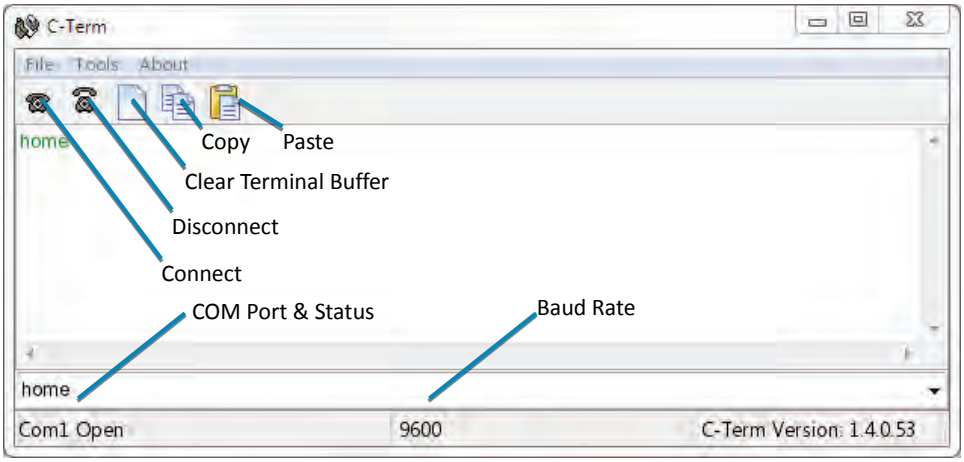


Figure 3-1 C-Term Window

Commands typed in this window are sent to the CETAC device connected to the opened port. The typed commands will appear in light green in the terminal buffer. Responses from the autosampler will appear in red. Non-printing characters such as carriage returns will appear as ASCII hexadecimal numbers surrounded by square brackets; for example, **[0D]** is the carriage return character**.**

Configuring C-Term

By default, C-Term attempts to open COM1 the first time it is executed. If the autosampler is connected to another COM port, configure C-Term to use the desired port.

1. On the Tools menu, click Setup Serial Port.
2. Select the desired COM port and click OK.

> **NOTE**
>
> The autosampler communicates at 9600 baud (which is the default.)
>
> Only installed COM ports, including USB virtual COM ports, will appear in the **Comm Port** menu.

Autosampler Commands

The following commands are helpful for verifying autosampler operation. This is not a comprehensive list of commands.

Command	Description
VER	Returns firmware version.
HOME	Returns probe to home position.
ABS=x-y-z	Moves to position defined in steps of 0.1 mm from the home position. Example: ABS=1000-1000-0 moves to X=100 mm, Y=100 mm, Z=top.
PMP ON	Turn the peristaltic pump on.
PMP OFF	Turn the peristaltic pump off.
RINSE	Moves probe to the rinse position, extends and retracts the probe 3 times and starts rinse pump. Stays in down position with pump running. UP, PMP OFF stops the pump.
DOWN=*n*	Moves the z-axis down by *n* mm.
UP	Moves z-axis to the top position.

Table 3-1 Autosampler Commands

CAUTION **Make sure that there is enough space for the probe to move.** Equipment damage can occur if the probe collides with an obstruction such as a vial or rack.

4 Disassembling the Autosampler

This chapter presents a suggested sequence for disassembling the autosampler in order to reach its internal components.

> **NOTE**
>
> In most cases, complete disassembly is not necessary. You only need to perform as many steps as are required to access the part you are replacing.

Remove the Tray

Simply lift the tray from the base.

Remove the Z-Drive

Removing the Z-drive reduces the chance of accidental damage and allows you to remove the cover from the autosampler. Reverse the steps in “Replacing the Z-Drive” beginning on page 16.

1. Loosen the nut on the crash block.
2. Loosen the thumbscrew on the Z-axis rotor and pull out the Z-drive cable.
3. Remove the thumbscrews which secure the Z-drive to the Y-axis carriage.
4. Slide the Z-drive off the Y arm.

Remove the Cover

1 Remove the 4 screws from the back of the autosampler.

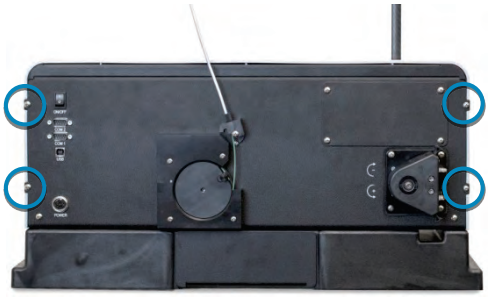


Figure 4-1 Cover Screws

2 Pull the cover forward.

Remove the Splash Shield

The splash shield protects internal components from corrosive or conductive chemicals.

1 Remove the 2 screws from the top of the splash shield.

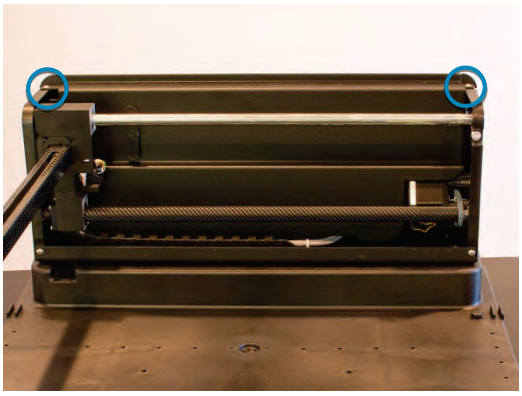


Figure 4-2 Splash Shield Top Screws

2 Remove the 2 screws from the front of the splash shield.

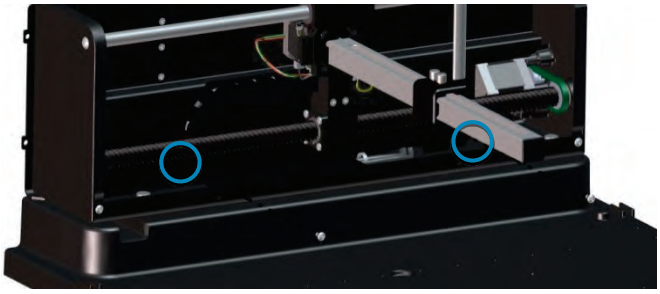


Figure 4-3 Splash Shield Front Screws

3 Lift the right side of the splash shield (as viewed from the front) then slide the shield to the left.

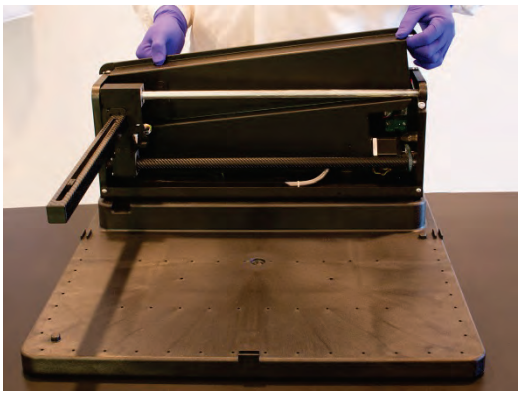


Figure 4-4 Lifting the Splash Shield

4 Lift the shield up and out of the autosampler.

Remove the Base

It is not always necessary to remove the base from the autosampler head, but doing so can make it easier to move the autosampler around to access it from different angles while you work.

1 Turn the autosampler upside-down.

2 Remove the four screws from the base.

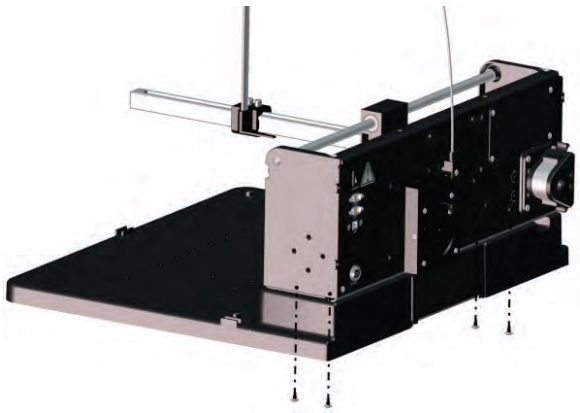


Figure 4-5 Screws in Autosampler Base

3 Remove the rubber gasket and feed the cables into the autosampler head.

NOTE

There are levelling screws which protrude from the bottom of the autosampler head. These screws do not normally need further adjustment, even if you are installing a new base on the autosampler.

Figure 4-6 Levelling Screw, Bottom of Autosampler Head

REASSEMBLY NOTE

The gasket is keyed to fit one way on the base.

Remove the Left Endplate

Be sure to remove the *left* endplate (as seen from the front of the right-side-up autosampler) first. The right endplate does not need to be removed for any field service procedure.

1 Remove the three screws from the left endplate.

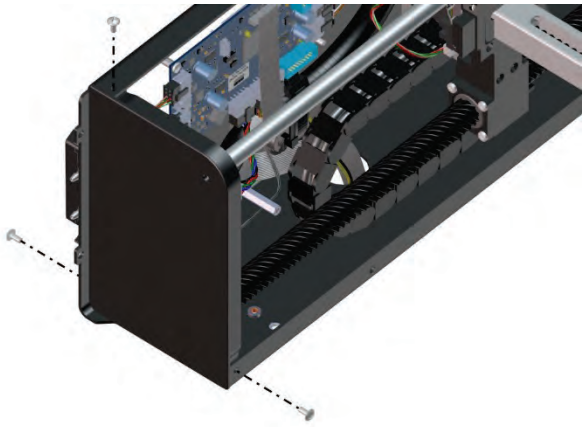


Figure 4-7 Screws Holding Left End Plate

2 Remove the screw which holds the guide shaft to the left endplate.

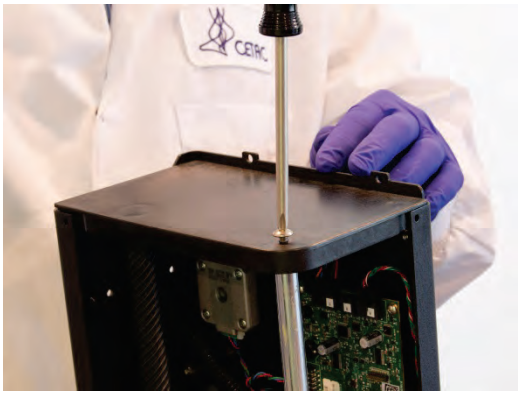


Figure 4-8 Screw Holding Guide Shaft

3 Loosen, but do not remove, the screw which secures the guide shaft to the right end plate. This will reduce strain and make it easier to remove the shaft from the right end plate later.

4 Pull off the left end plate.

5 There is a washer at the end of the lead screw. It may stick to the endplate, which is okay. If it sticks to the guide shaft, remove it and set it aside.

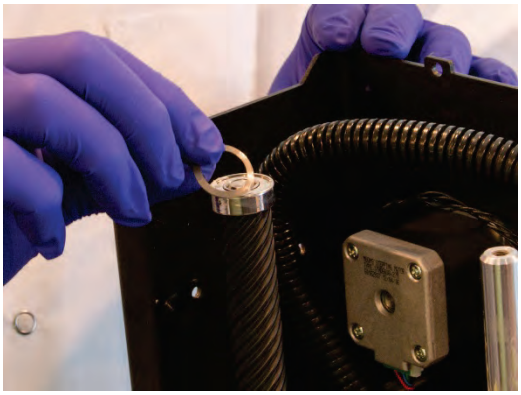


Figure 4-9 Lead Screw Washer

Remove the X Drive Assembly

1 Remove the 2 screws which are just below the arm.

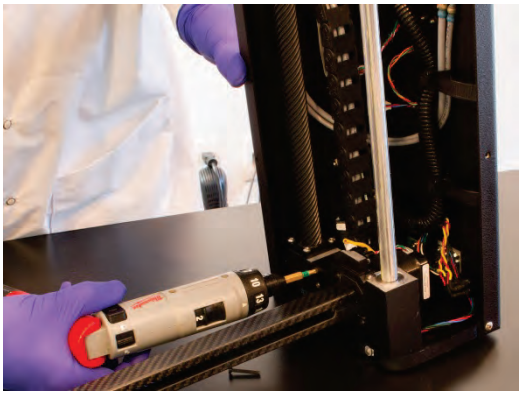


Figure 4-10 Screws Holding X Drive Cable Assembly

2 Disconnect the first sensor cable (whichever one you can reach).

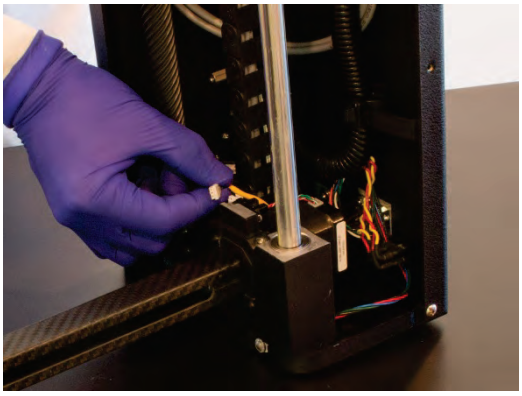


Figure 4-11 X Sensor cable

3 Slide the carriage and disconnect the other sensor cable.

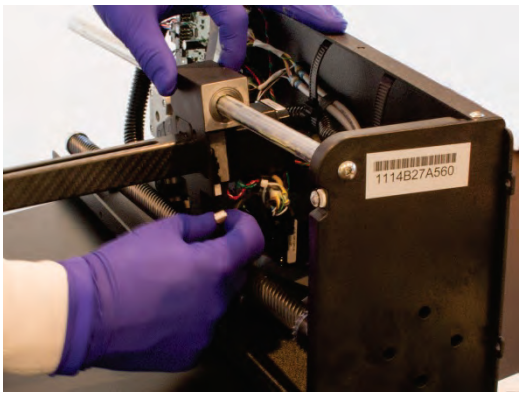


Figure 4-12 Y Sensor Cable

4 Disconnect the motor cable.

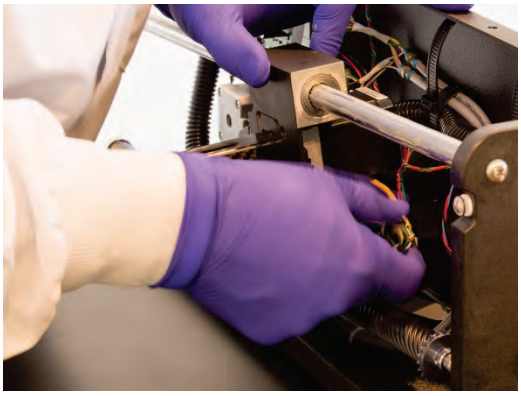


Figure 4-13 Motor Cable

The “shelf” which holds the cables should now be free.

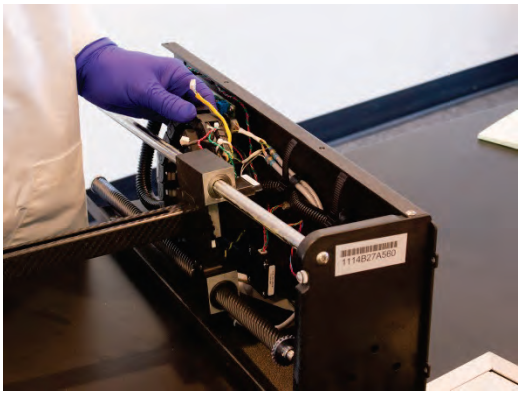


Figure 4-14 All X Assembly Cables Disconnected

5 Remove the screw which secures the guide shaft to the right end plate.

6 Pull the X drive assembly out of the autosampler.

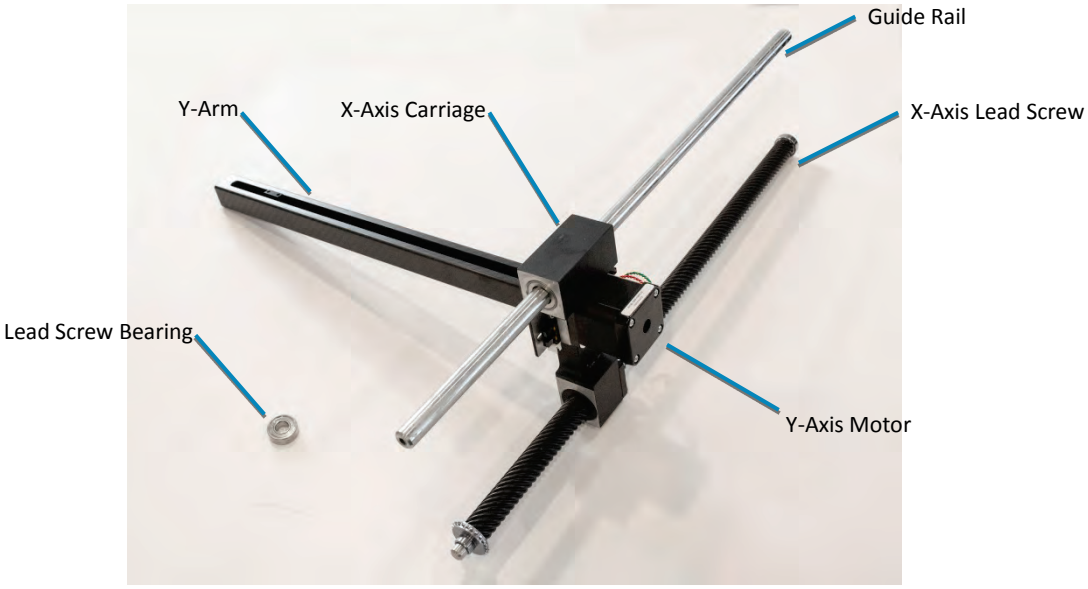


Figure 4-15 X Drive Assembly

Disassemble the X Drive Assembly/ Carriage

1. Slide the guide rail out of the carriage.
2. Remove the bearing from the left end of the X-axis lead screw. You may need to use a small gear puller to pull off the bearing. You do not need to remove the bearing or the sprocket from the right end of the lead screw.

Figure 4-16 Gear Puller

3. Thread the lead screw out of the carriage.

   If you wish, you may defer the following steps until after the arm has been removed from the carriage:

4. Remove the 4 screws which hold the collar over the lead screw nut.
5. Remove the lead screw nut.

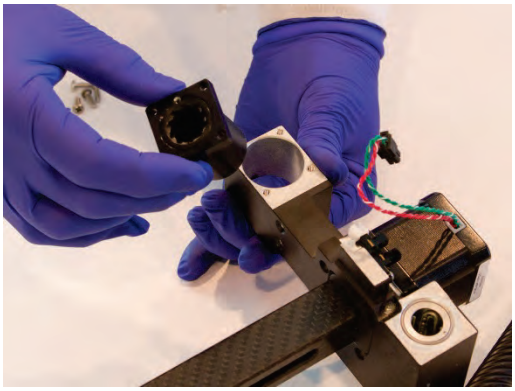


Figure 4-17 X-Axis Lead Screw Nut

6 Remove the screws which hold the linear bearings which ride along the guide rail. Pull out the two linear bearings.

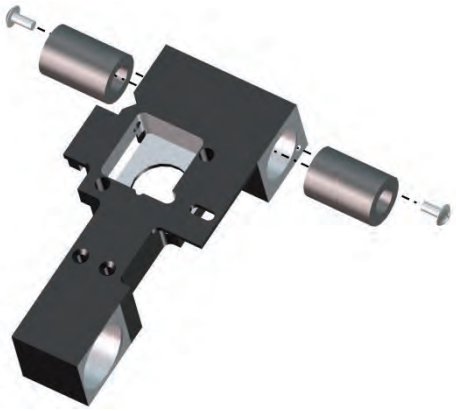


Figure 4-18 X-Axis Linear Bearings

Figure 4-19 X-Axis Linear Bearings

REASSEMBLY NOTE

When reassembling, coat the first ¼" of the X-carriage bore on both sides using PTFE grease. Ensure the ball raceways are opposite each other and not in-line.

Remove the Y Arm from the Carriage

1 Remove the black PEEK screw from which secures the end cap of the Y arm.

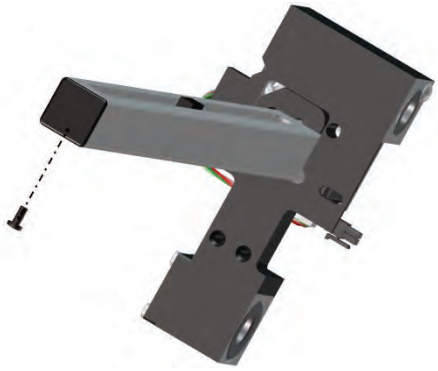


Figure 4-20 Y Arm End Cap

2 Pull off the end cap.

3 Locate and set aside the wave spring (washer). It may be in the end cap or on the end of the Y-axis lead screw.

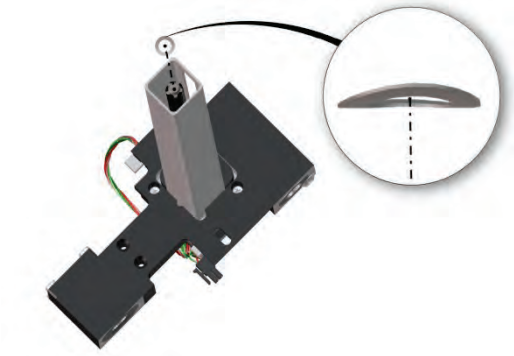


Figure 4-21 Y-Axis Wave Washer

4 Use a 3/32” Allen wrench to loosen the set screw in the X-axis carriage.

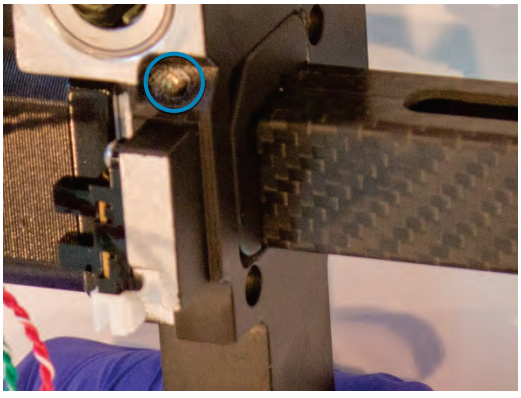


Figure 4-22 Y Arm Set Screw

5 Pull the Y arm and lead screw away from the carriage.

6 Remove the Y-axis lead screw from the arm. It is possible to remove the lead screw with the nut still attached by tilting the lead screw into a corner of the arm. If this proves to be too difficult, turn the lead screw until the nut comes off of the end.

REASSEMBLY NOTE

When reassembling, apply a little Loctite 242 on the set screw.

Remove the Motor from the Carriage

1 Note the orientation of the motor so that you can reinstall it properly.

2 Remove the 2 M3 x 8mm screws which hold the motor to the carriage.

Remove the Sensors

The X- and Y-axis home position sensors are each held in place with a single screw.

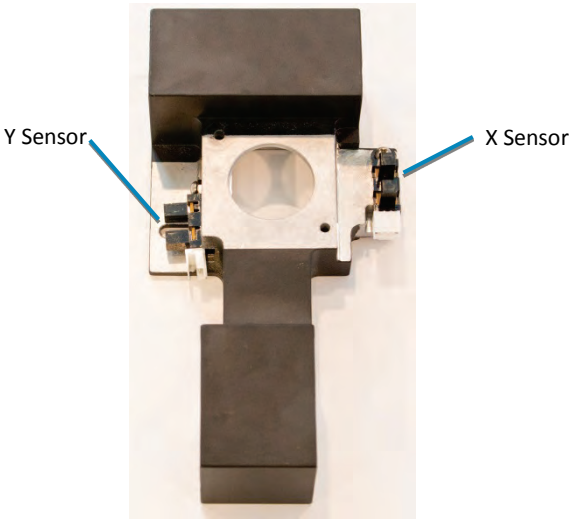


Figure 4-23 X and Y Sensors

Remove the E-Chain

The “E-chain” is the wiring harness for the sensors and motors on the Y-axis assembly, encased in a protective plastic chain.

1 Remove the 2 connectors from the main circuit board.

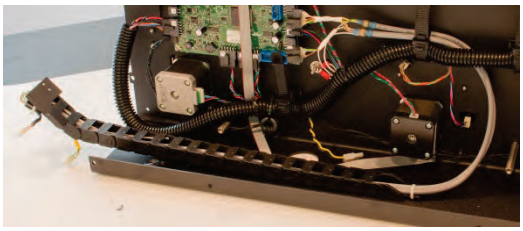


Figure 4-24 E-Chain Detached from Circuit Board

2 Remove the grounding lugs.

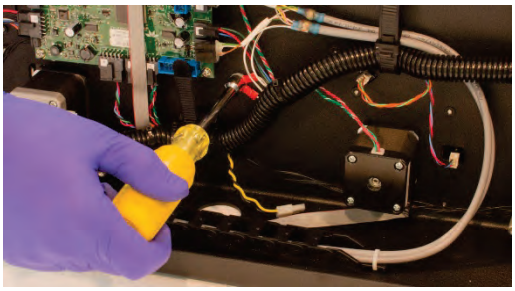


Figure 4-25 Grounding Lugs

3 Unfasten the center cable strap (lift and pull the latch).

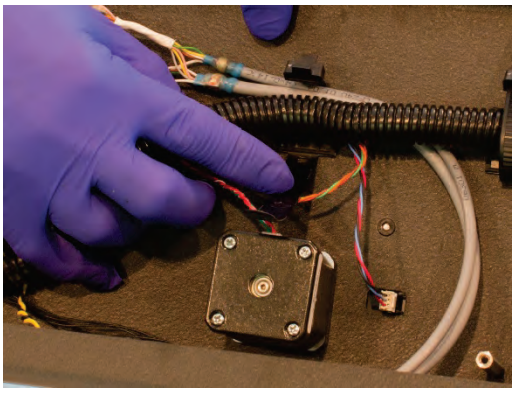


Figure 4-26 Cable strap

4 Cut the wire tie and lift the wires to expose the mounting screws.

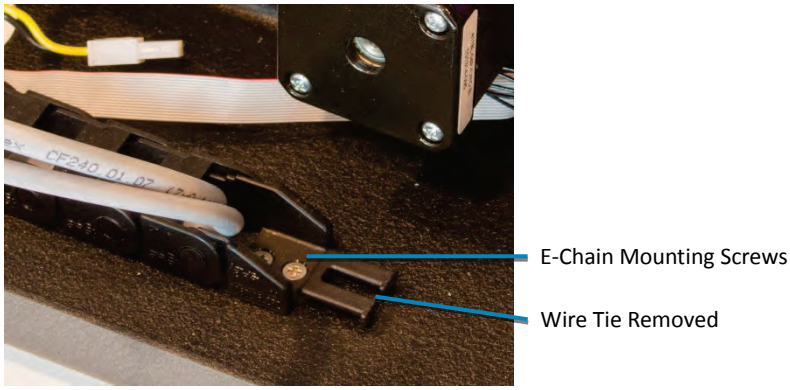


Figure 4-27 X and Y Sensors

5 Remove the 2 mounting screws.

6 Lift the E-chain out of the autosampler.

5 Repair Procedures

Replacing the Pump

The peristaltic pump can be replaced without opening up the autosampler.

1 Remove the 4 screws from the pump.

Figure 5-1 Pump Screws

2 Disconnect the cable from the pump.

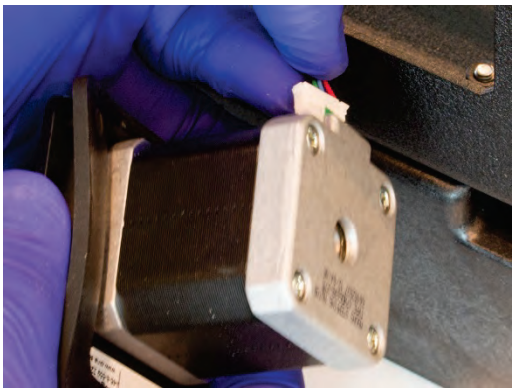


Figure 5-2 Pump Connector

3 Install the new pump.

Replacing the Rotor/Stator

The Z axis rotor and stator can be replaced without opening up the autosampler. Replacing the motor requires access to the interior of the autosampler.

1. Disconnect the Z drive cable from the rotor.
2. Remove the 4 screws from the stator.

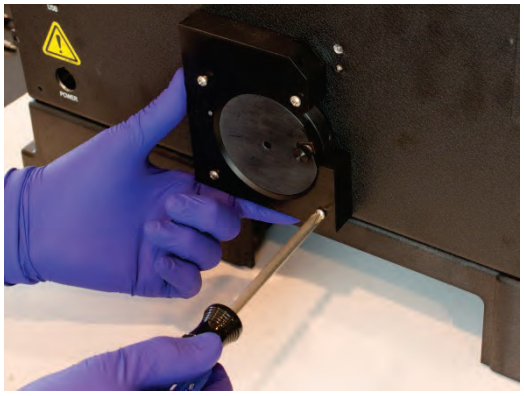


Figure 5-3 Stator Screws

3. Turn the rotor counterclockwise so that the "flag" is visible.
4. Lift off the stator.

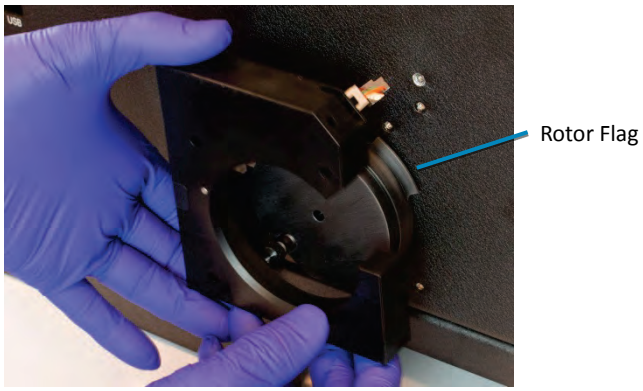


Figure 5-4 Removing the Stator

5. Unplug the two connectors.

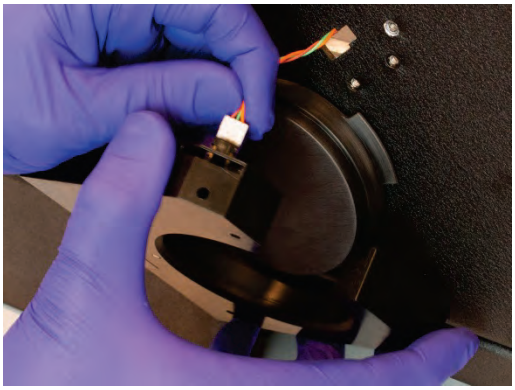


Figure 5-5 Stator Sensor Connectors

6 Remove the rotor set screw using a 1/16” Allen wrench.

Figure 5-6 Rotor Set Screw

The stator contains two sensors. One detects when the Z axis has returned to the home position. The other is triggered when the probe hits an obstruction, causing the Z drive cable to bend and pivoting the crash block.

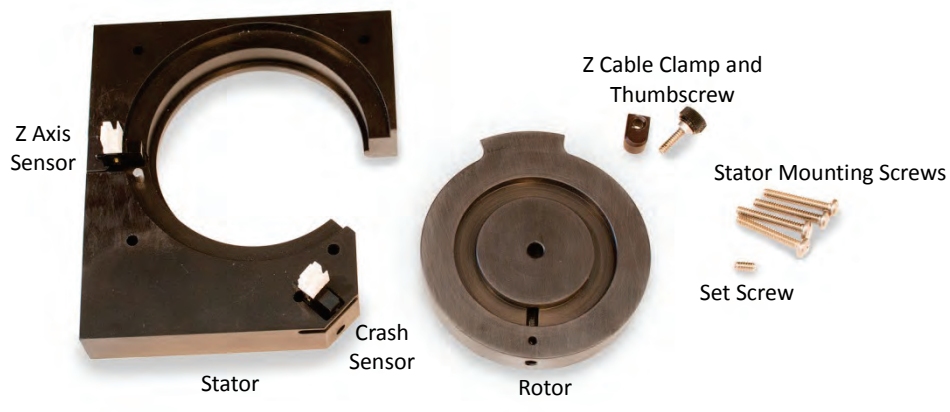


Figure 5-7 Parts of the Rotor/Stator Assembly

Replacing the Z Axis Motor

1. Remove the rotor and stator.
2. Remove the cover.
3. Remove the splash shield.
4. Follow the wire from the motor to the main circuit board and unplug it. You will need to thread the wire out of the flex tubing.
5. Remove the 2 screws (under the rotor).

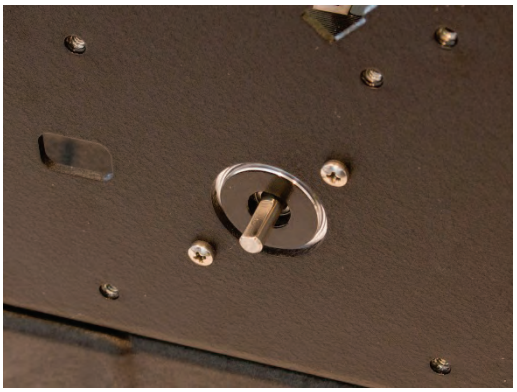


Figure 5-8 Z Motor Screws

6. Replace the motor.
7. Replace the rotor and stator. Move the rotor and carefully listen and feel for friction. In rare cases, it may be necessary to align the motor; contact Teledyne CETAC Technologies if you think the alignment might need to be adjusted.

Replacing the Crash Block

The crash block is also called the "guide block" or "anti-kink" block. The block pivots when the probe hits an obstruction, allowing the Z drive cable to bend naturally without kinking.

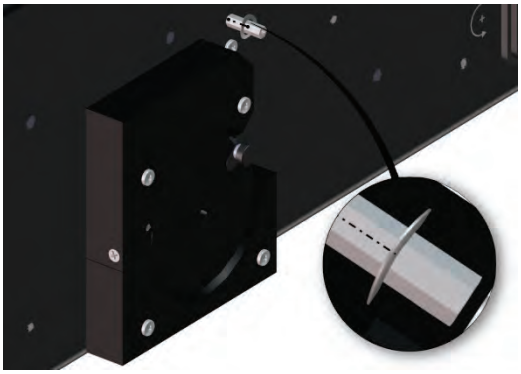
As the block pivots, a sensor inside the stator detects the "crash;" software or firmware can then potentially react to this signal. The autosampler firmware does not currently use the crash signal.

A spare crash block is provided with each Z drive. In most cases, the crash block does not need to be replaced.

1. Loosen the nut on the old crash block.
2. Free the Z drive cable from the rotor.
3. Pull the Z drive cable out of the crash block.
4. Remove the screw and pull off the old crash block.

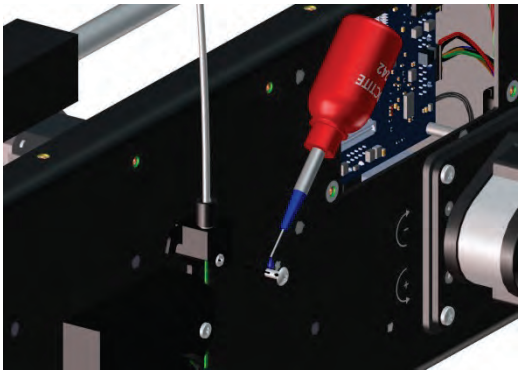
5 Pull the old washer off of the standoff and discard it.

6 Place the new washer (wave spring) on the standoff.



7 Apply a drop of Loctite 242 to the threads of the new screw.

8 Use the new screw to secure the crash block to the standoff.



9 Check that the block moves freely, with the “flag” moving into the slot in the side of the stator.

10 Replace the Z drive cable.

Replacing the X Axis Drive Belt

1 Remove the cover.

2 Remove the splash shield.

3 Remove the guide shaft screw from the right end plate.

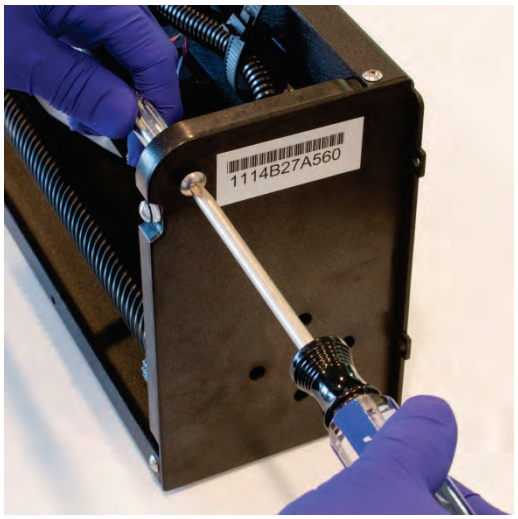


Figure 5-9 Guide Shaft Screw

4 Remove the remaining 3 screws from the right end plate.

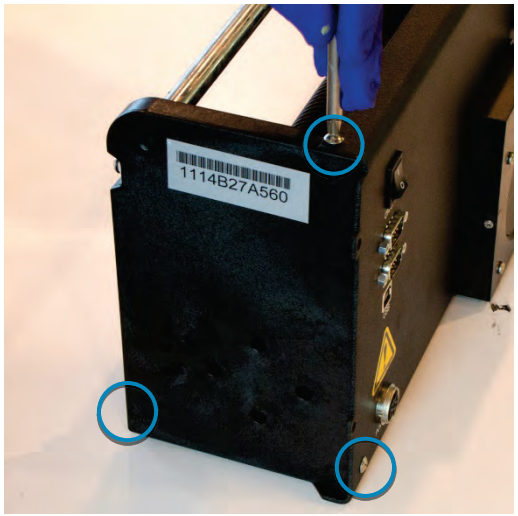


Figure 5-10 End Plate Screws

5 Remove the 4 motor mounting screws from the right end plate.

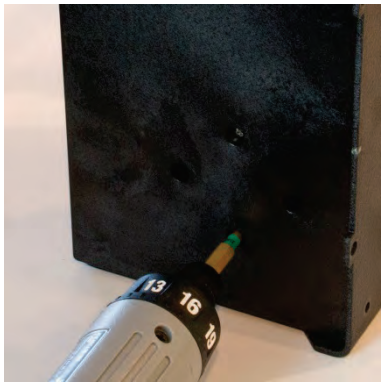


Figure 5-11 Motor Screws

6 Remove the old belt.

7 Place the new belt over the end of the lead screw and over the sprocket on the motor.

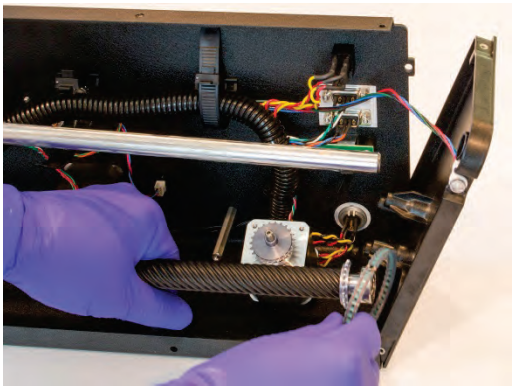


Figure 5-12 Threading the Belt Over the Lead Screw

8 Reattach the end plate and secure the guide shaft.

9 Lightly attach the screws which hold the motor. The motor should still be free to move around a bit.

10 Engage the belt on the motor sprocket and on the sprocket on the lead screw.

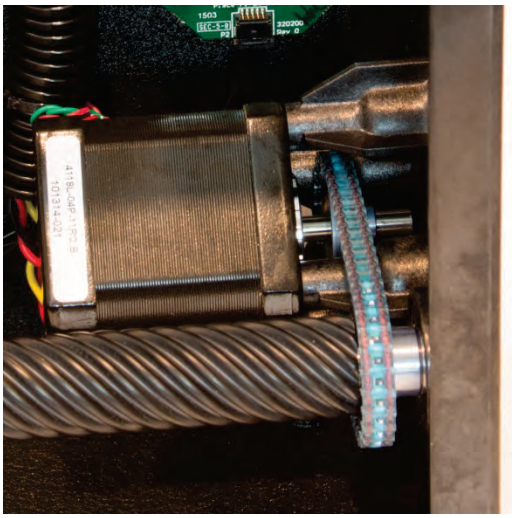


Figure 5-13 X Axis Drive Belt In Position

11 Tighten the motor screws.

Replacing the USB Port

1. Remove the cover.
2. Remove the splash shield.
3. Disconnect the cable from back of the USB port PCB.

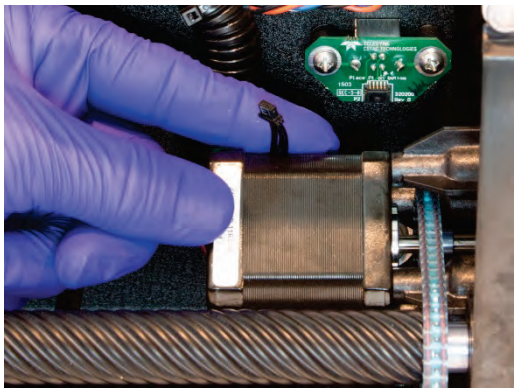


Figure 5-14 USB Port Connector

4. Unscrew the USB port.

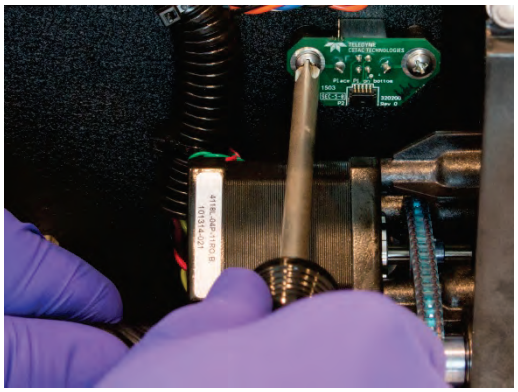


Figure 5-15 USB Port PCB

5. Install the new port.

Replacing the Main Circuit Board

CAUTION

EQUIPMENT DAMAGE FROM ELECTROSTATIC DISCHARGE
Use standard ESD precautions such as a wrist strap and a static-free work surface.

1. Remove the cover.
2. Remove the splash shield.
3. Slide the arm to the right.
4. Disconnect all of the cables.

   Note where each cable was plugged in. On each edge of the circuit board, no two connectors are identical. If you don't bend the cables to far out of the way, it should be pretty easy to get them back in the right spot.

Figure 5-16 Removing the Cables

5. Remove the 4 screws.

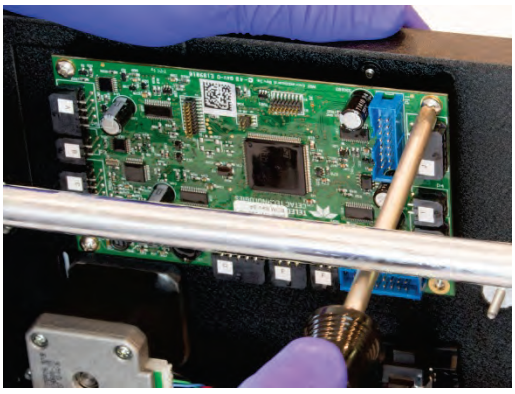


Figure 5-17 Removing the Screws

6. Replace the board.

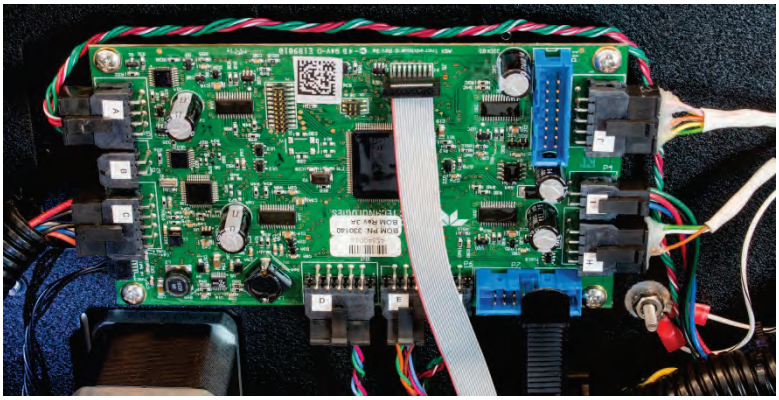


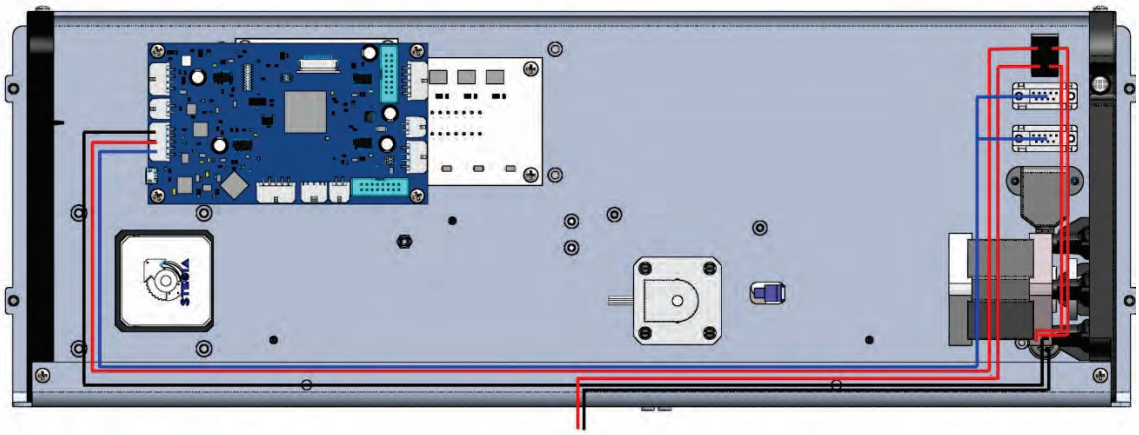
Figure 5-18 Main Circuit Board with Connections

7 If necessary, use the ASX Dashboard software to program the firmware version and personality.

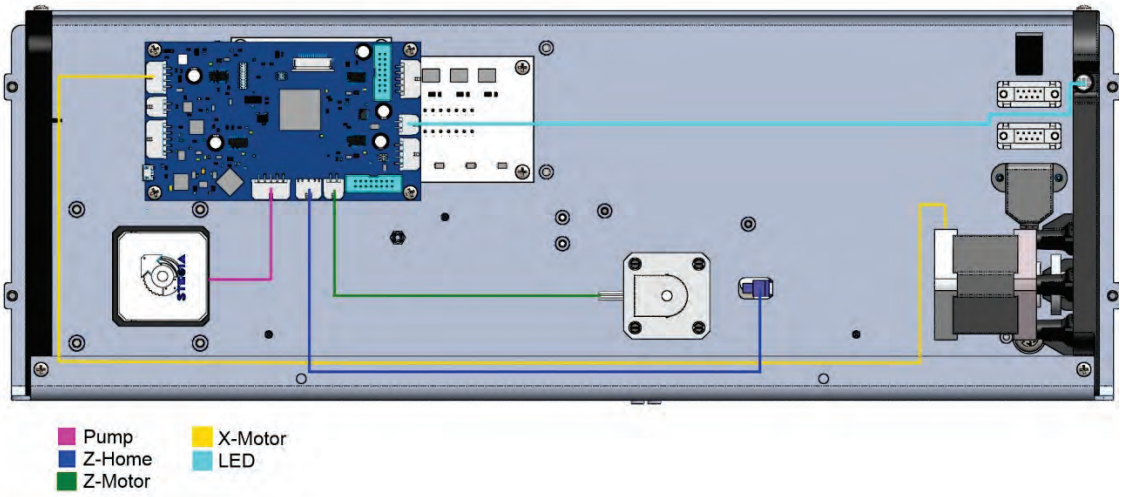
6 Diagrams

Wire Routing and Cable Connections

Power/Serial Cable



Motors/Home Sensors/LED/Pump



E-Chain